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Eurasian Goshawk nesting in relation to prey numbers in Telemark, southern Norway

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Abstract
In southern Norway, the breeding density of Eurasian Goshawk *Accipiter gentilis* has typically ranged between 2–4 pairs per 100 km^2. However, not all territorial pairs attempt to nest each year. In a ca. 2000 km^2 forest-dominated study area in central parts of Telemark County, the highest number of nesting attempts recorded per year during 1991–2022 was 46, and the highest number of successful nesting attempts was 40. The nesting success of Goshawks increased with age and was 66.7% for juveniles (n = 12), 79.3% for subadults (n = 82) and 89.4% for adult females (n = 736). The annual proportion of young Goshawk females (juveniles and subadults) depended on the annual proportion of recorded replacements of old females and was positively related to mean temperatures in April. The annual proportion of recorded substitutions was positively correlated with population indices of several important prey species, particularly forest grouse, and without a time-lag. In a multiple regression model, the relative change in the recorded number of Goshawk nesting attempts, compared to the previous year, was positively correlated with a population index for thrush spp. and a combined index for Wood Pigeon *Columba palumbus* and Hooded Crow *Corvus cornix*, without a time-lag, and with a combined index for Capercaillie *Tetrao urogallus* and Black Grouse *Lyrurus tetrix*, with a one-year time-lag. The one-year time-lag with grouse was most evident when only successful nesting attempts were considered. We conclude that the breeding densities of Goshawk in Telemark are rather stable, and we conclude that annual variation in the number of recorded nesting attempts to a large extent reflects the effects of variation in prey density on the body condition of female Goshawks.

INTRODUCTION

The breeding density of medium-sized and large raptor species is known to be rather stable (Newton 1979). Raptors often have high longevity and territorial behaviour, and the distribution of established nesting territories is usually not affected by short-term fluctuations in prey abundance. When a territorial individual dies, the bird will be replaced by an individual from the floating population of younger surplus birds. Annual fluctuations in prey number may, however, affect the number of pairs that attempt to nest, and the number of successful nesting attempts, and thus give an impression of a correlation between raptor and prey abundance (Newton 1979).

The Eurasian Goshawk *Acccipiter gentilis* is a medium-sized raptor species, which is well-adapted for hunting of medium-sized and large birds in forest-dominated landscapes (Widén 1989, Marcström et al. 1990), but also preys upon mammalian species (Widén 1987). In Fennoscandia, Goshawk populations declined after the introduction of modern forestry in the mid-1900s (Widén 1997). In recent decades, the breeding density has typically been between 2–4 pairs per 100 km2 in forest-dominated landscapes in South Norway, with higher densities in areas with a higher proportion of mature forest (Selås et al. 2008).

Not all territorial Goshawks attempt to breed each year (Marcström et al. 1990), which can give the impression of frequent occurrence of „empty" territories. For instance, Tornberg et al. (2006) reported a yearly mean occupancy rate of ca. 80% in the vicinity

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Figure 1. Map of Norway showing forested areas (green) and the approximate location of the study area (black rectangle). Source: The Norwegian Mapping Authority (Creative Commons Attribution Share Alike 3.0).

of Oulu, Finland. Especially in years with poor food supply, many territorial Goshawk pairs may refrain from nesting. If a situation with lowered prey density lasts for several years, some of the nesting territories may eventually be abandoned (Wikman & Lindén 1981). The impact of food limitation may also depend on the age of the nesting Goshawk female, because young females are known to perform less well than older individuals (Nielsen & Drachmann 2003).

A delayed effect in Goshawk breeding density is expected in periods with increases in prey density. Delays occur because territorial behaviour by the established Goshawk pairs, which are usually regularly spaced in our study area, may make it difficult for newcomers to settle between them (Selås 1997). In any case, the apparent occupancy rate, or more precisely the proportion of territorial pairs that attempt to nest, is probably high in such periods.

In forest-dominated landscapes, the most important prey species for Goshawks during winter are grouse, corvids and Red Squirrel *Sciurus vulgaris*, and Goshawk females may also kill adult Mountain Hare *Lepus timidus* (Widén 1987, Tornberg & Colpaert 2001). Short-term fluctuations in the abundance of these prey are likely to affect the body condition of Goshawks, and thus the number of nesting attempts (Newton 1979, Kenward et al. 1999, Kenward 2006). For both Goshawk and Gyrfalcon *Falco rusticolus*, Selås and Kålås (2007) found a significant correlation between a territory occupancy index and grouse indices based on autumn hunting statistics, with a one-year time-lag.

The proportion of Goshawk pairs that succeed with their nesting attempt may be affected also by the density of prey that are most important during the breeding season (Salafsky et al. 2005). Unsuccessful pairs could easily be overlooked, and an analysis of annual fluctuations in recorded nesting attempts should consider the abundance of prey that are important in spring and summer. For example, the abundance of thrushes *Turdus* spp. can have high annual variation (Karlsson & Källander 1977, Hogstad et al. 2003, Hogstad 2013), and also comprise a high proportion of the prey delivered to Goshawk nestlings in South Norway (Hagen 1952, Grønnesby & Nygård 2000, Johansen et al. 2007).

In this study, we use data from a 32-year study in a forested area in South-Norway with a relatively dense breeding population of Goshawk (Selås et al. 2008) to test for potential relationships with the number of important prey species killed by hunters in autumn. Our hypotheses were that 1) the numbers of territorial Goshawk pairs are rather stable, 2) the yearly number of nesting attempts, as well as the number of successful nesting attempts, are positively related to indices of prey abundance, and 3) there should be a one-year time-lag for prey species that are most important in winter.

METHODS

The study was conducted during the 32-year period of 1991–2022 in the three municipalities of Midt-Telemark, Nome and Notodden in Telemark County, South Norway (Figure 1). A few nesting territories of Goshawks situated in neighbouring municipalities, close to the borders of the selected municipalities, were also included. The total study area is approximately 2000 km^2. About 75% of the area is covered by forest, the remaining consists of lakes, bogs, alpine areas, farmland and urban areas. Most of the forests are harvested by modern forestry practices with clear-cutting, planting and thinning of the regrowth, and thus consists of forest stands of different age classes. Goshawk nest sites are usually situated in mature forests, and are therefore often affected or destroyed by logging.

The study area was searched for Goshawk nests each year from 1988 onwards, but data from the first three years were not used because hunting statistics for prey species were not available until 1991 and onwards. Much time was spent by searching for visible signs of nesting in areas regarded as suitable for nesting Goshawks, which included nest sites, plucking posts, moulted feathers and droppings. Nests in use contain green twigs, and if the nesting attempt has been successful, there will be many droppings and prey remains below the nest. Nests with signs of breeding in a previous year were included if there was no doubt to which year the site was used, based on knowledge to where that goshawk pair nested in the years before and after the year in question. In such cases, nesting success remained unknown, unless fledged young had actually been observed in the area that year.

To minimize the potential impacts of human disturbance, nest trees were only climbed occasionally, in connection with ringing of the young that was conducted by members of Birdlife Norway. Since the exact number of nestlings or fledglings was usually not known, nesting success was recorded as either successful or unsuccessful. By comparing patterns in moulted feathers, it was often possible to tell whether the nesting Goshawk female was the same individual as the previous year, or if the bird was newly established in the territory. For 130 comparisons where DNA analyses of the feathers were also conducted, 125 comparisons (96.2%) gave the same result as the feathers (Selås et al. 2017). Moulted feathers were also used to classify Goshawk females as juveniles (one year old), subadults (two years old) or adults (≥three years old). Goshawk males spend less time at the nest site, and it was not possible to find enough feathers for individual recognition of males.

The number of recorded nesting attempts increased steadily during the first half of the study period (Figure 2). The increase was due to increased experience with the study area and monitoring Goshawk nesting territories, and not to increased breeding density or increased field effort. The trend in the time series was removed by using first differences of log-transformed data. We then obtained a new index that gives relative change in the number of recorded nesting attempts, compared to the previous year, for the period 1992–2022. We also calculated the annual proportion of young females among birds of known age, the annual proportion of successful nesting attempts among nests with known nesting success, and the annual proportion of replacements of nesting Goshawk females among cases where the nesting female was identified both in the current and previous year. The later index refers to the 31-year period of 1992–2022.

The main explanatory variables for variation in reproductive effort were the annual number of nine game species harvested and reported by hunters in autumn in Telemark and Vestfold Counties, available from 1991 onwards (Statistics Norway 2024). The selected species (with mean annual number killed in parentheses) included: Capercaillie *Tetrao urogallus* (618), Black Grouse *Lyrurus tetrix* (2003), Hazel Grouse *Tetrastes bonasia* (208), Common Wood Pigeon *Columba palumbus* (7237), Hooded Crow *Corvus cornix* (1832), Eurasian Jay *Garrulus glandarius* (836), thrush spp. (1289), Red Squirrel (126) and Mountain Hare (2358). All indices of prey numbers had a negative trend during the study period, possibly because of reduced recruitment to the hunter population, so the first differences of log-transformed data were used, which restricted these data to the period 1992–2022, or

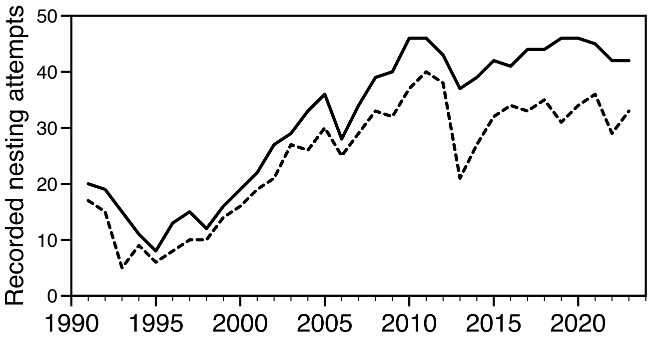

Figure 2. Annual number of all nesting attempts (solid line) and successful nesting attempts (dotted line) recorded for Goshawks breeding in central parts of Telemark County, southern Norway, during 1991–2023. The apparent increase during the first half of the study period was caused by increased experience with monitoring Goshawk nesting territories, and not by an increased breeding density or increased field effort.

to 1993–2022 when testing for relationships between Goshawk indices and prey indices of the previous year.

The assumption is that relative changes in annual bag statistics reflect underlying annual changes in population numbers. Except from the Mountain Hare, all prey species were positively correlated with one or two other prey species (Table 1), which means that they are likely to exclude each other in multiple analyses. None of the correlation coefficients were higher than what should be acceptable to avoid collinearity among explanatory variables in a multiple regression analysis (Dormann et al. 2012), but we used a combined index for the two species pairs with the strongest correlation (Table 1), calculated as the mean of the first difference of the log-transformed data. The correlation between Wood Pigeon and Hooded Crow is likely to be caused by similar response to unfavourable weather conditions in spring. Capercaillie and Black Grouse are forest-dwelling species of grouse that are known to fluctuate in synchrony.

We also tested for relationships with winter and spring weather conditions for both Goshawk and prey indices. Monthly data on temperature, precipitation and snow cover were taken from the nearest meteorological station with continuous measures for the study period (Norwegian Centre for Climate Services 2024). The closest station with continuous temperature data was Tveitsund (252 m elevation) in Nissedal Municipality, the closest station with precipitation data was Notodden (34 m elevation), and the closest station with snow cover data was Postmyr (464 m elevation) in Drangedal Municipality.

We used the cross-correlation function to test for possible relationships between Goshawk nesting and indices of prey abundance. In these analyses, a significant positive lag of one year means that the Goshawk index was positively related to the prey index during the previous year. Thereafter, we fitted multiple linear regression models with the Goshawk indices as a response variable and different prey indices as possible

Table 1. Pair-wise relationships between the indices for prey species used in the analyses during the period 1992–2022 (n = 31, except for jay, where n = 30). The lower left quadrant of the table gives correlation coefficients (r) whereas the upper right quadrant gives the p-values, with significant values in bold. The indices were calculated as the first-differences of log-transformed number harvested by hunters in autumn in Telemark and Vestfold Counties (Statistics Norway 2024).

	Capercaillie	Black Grouse	Hazel Grouse	Wood Pigeon	Hooded Crow	Eurasian Jay	Thrush spp.	Red Squirrel
Capercaillie		**<0.001**	**0.031**	0.278	0.764	0.912	0.775	0.192
Black Grouse	0.62		0.124	0.615	0.271	0.063	0.675	0.831
Hazel Grouse	0.39	0.28		0.800	0.420	0.460	0.092	**0.001**
Wood Pigeon	-0.20	0.09	0.05		**<0.001**	0.111	0.997	0.107
Hooded Crow	0.06	0.20	0.15	0.63		**0.006**	0.380	0.111
Eurasian Jay	-0.02	0.34	0.14	0.30	0.49		**0.012**	0.908
Thrush spp.	0.05	0.08	0.31	<0.01	0.16	0.45		**0.003**
Red Squirrel	0.24	0.04	0.58	0.29	0.29	0.02	0.51	

Table 2. Coefficients of determination (R^2) from regression analyses between prey species indices and snow cover (negative effect) and temperature (positive effect) indices in late winter or spring 1992–2022 (n = 31). The prey species indices are first-differences of log-transformed number killed by hunters in autumn in Telemark and Vestfold Counties during 1991–2022 (Statistics Norway 2024). Significant values are in bold.

Species	Snow cover			Temperature	
	February	March	April	February	March
Wood Pigeon	**0.16**	**0.31**	0.09	**0.22**	**0.23**
Hooded Crow	**0.17**	0.11	**0.20**	0.09	0.10
Eurasian Jay	0.06	0.02	**0.20**	0.08	**0.17**

explanatory variables, with time-lags in accordance with the results of the cross-correlation analyses. The residuals of the selected regression models satisfied the criteria of independence, homoscedasticity and normality. The software used for statistical analyses was JMP Pro 17.2.0.

RESULTS

Nesting success, age and substitutions of Goshawk females

The numbers of recorded nesting attempts of Goshawks varied from 8 to 46 nesting attempts per year during 1991–2022 (mean 31.16, SE = 2.56, n = 32), and the number of successful attempts per year ranged from 5 to 40 (mean 24.34, SE = 1.86, n = 32; Figure 2). The annual proportion of successful Goshawk nesting attempts among those with known outcome (Appendix 1) varied from 57 to 96% (mean 81.4%, SE = 1.59, n = 32). The index of nesting success was not significantly correlated with any of the prey or weather indices, although the year with the lowest nesting success, 1993, also had the lowest April temperature during the study period.

The material was not sufficient to calculate annual nesting success for each age class of Goshawk females, but for the pooled information, the nesting success increased with age from 66.7% for juveniles (n = 12), 79.3% for subadults (n = 82), and 89.4% for adult females (n = 736). For adult females known to be new in the territory, the nesting success was 88.1% (n = 59). For returning birds known to have nested in the territory in the preceding year, the nesting success was similar at 89.2% (n = 535). All values are maximum estimates, because unsuccessful nesting attempts were overrepresented in cases where feathers for individual identification were not found.

The proportion of young Goshawk females (juveniles and subadults) among known age birds (Appendix 1) varied among years from 0 to 37% (mean 10.41, SE = 1.57, n = 32). The proportion of young females was, as one would expect, positively related to the proportion of replacements among cases where females were identified in both the current and previous year (R^2 = 0.31, p = 0.001, n =31). The proportion was also positively related to temperature in April (R^2 = 0.14, p = 0.040, n = 32), and negatively to snow cover in April (R^2 = 0.13, p = 0.047, n = 32). The best multiple regression model (R^2 = 0.56, n = 31) contained the two factors of proportion of replacements (p < 0.001) and April temperature (p = 0.002). Weather conditions in late winter or early spring seemed to affect also some of the prey species (Table 2). There were no significant results for the other prey species not mentioned in Table 2, or for precipitation as explanatory variable.

The proportion of Goshawk female replacements varied among years from 0 to 43% (mean 17.59, SE = 1.94, n = 31). The index of female turnover was positively related to the population indices of Capercaillie/Black Grouse and Hazel Grouse, without a time lag (Figure 3), and there were nonsignificant trends for a similar relationship with the indices for Wood Pigeon/Hooded Crow (p = 0.073), thrushes (p = 0.062) and Red Squirrel (p = 0.067).

Number of nesting attempts and prey indices

The relative change in recorded nesting attempts was significantly related to the population indices of Hazel Grouse and thrushes, without a time-lag (Figure 4). A similar tendency was found with the positive relationship with the index for Eurasian Jay (p = 0.061, n = 30) and a tendency for a negative relationship with snow cover in April (p = 0.063, n = 31). For the Hazel Grouse, there also was a significant negative correlation coefficient at time lag 2, but this finding is most likely an arbitrary result, not noteworthy in a sequence of 21 sample cross-correlations, as there is no a priori reason to expect a two-years delayed negative effect of this prey on Goshawks.

In a multiple regression model, both the indices for thrush and Hazel Grouse of the current year contributed with a positive effect (Table 3). The relationships with the Wood Pigeon/Hooded Crow index of the current year and the Capercaillie/Black Grouse index of the previous year were not significant in cross-correlation analyses, but these two indices contributed significantly together with the thrush and Hazel Grouse indices (Table 3).

When only nesting attempts of adult Goshawk females were used, there still was a significant correlation with the thrush index without a time-lag (p = 0.048, n = 31), but not with the Hazel Grouse index (p = 0.174, n = 31). Instead, the relationship with the Wood Pigeon/Hooded Crow index became significant (p = 0.012, n = 31). In a multiple regression model, thrushes and the Wood Pigeon/Hooded Crow indices contributed significantly, together with the Capercaillie/Black Grouse index of the previous year (Table 3).

When using only successful nesting attempts, there was a significant positive correlation with the Capercaillie/Black Grouse index, with a one-year time-lag (p = 0.035, n = 30). There was a similar tendency for the population index of the Red Squirrel (p = 0.084, n = 30), but the effect was weaker in a multiple regression model that also included the Capercaillie/Black Grouse index (p = 0.13, n = 30). When considering only successful nesting attempts of adult Goshawks, there still was a significant correlation with the Capercaillie/Black Grouse index, with a one-year time-lag (Figure 5). Again, there was a similar tendency for the Red Squirrel (p = 0.061, n = 30), even in the multiple model (p = 0.097, n = 30).

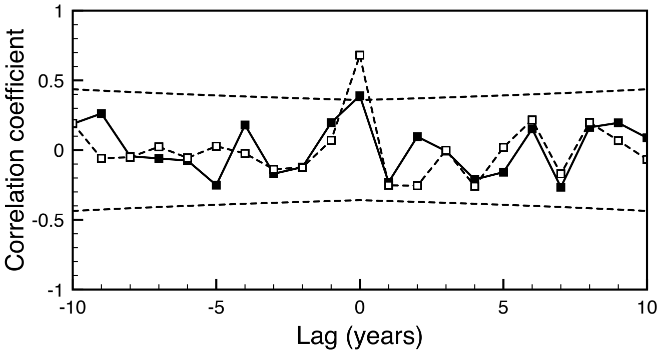

Figure 3. Cross-correlation coefficients calculated between the annual proportion of replacements of nesting female Goshawks in central parts of Telemark 1992–2022 versus population indices for Capercaillie/Black Grouse (solid line, filled quadrats) and Hazel Grouse (hatched line, open quadrats). The prey species indices are first-differences of log-transformed number of birds harvested by hunters in autumn in Telemark and Vestfold Counties (Statistics Norway 2024). Horizontal dotted lines indicate the critical value for p = 0.05.

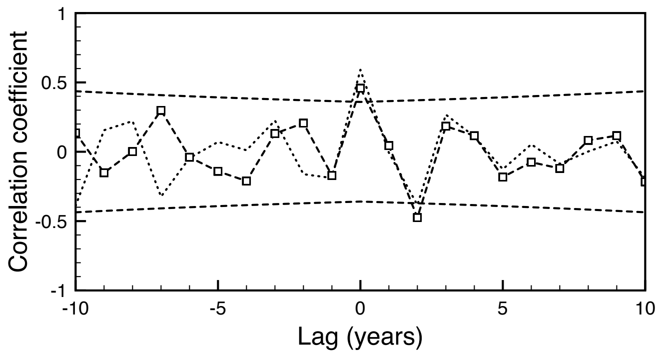

Figure 4. Cross-correlation coefficients calculated between the relative change in number of recorded nesting attempts of Goshawks in central parts of Telemark 1992–2022 versus population indices for Hazel Grouse (hatched line, open quadrats) and thrushes (dotted line, no symbols). The prey species indices are first-differences of log-transformed number harvested by hunters in autumn in Telemark and Vestfold Counties (Statistics Norway 2024). Horizontal dotted lines indicate the critical value for p = 0.05.

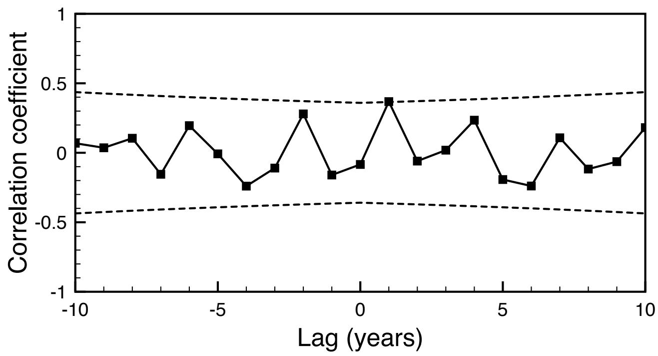

Figure 5. Cross-correlation coefficients calculated between the relative change in number of successful nesting attempts of adult female Goshawks (≥3 years old) in central parts of Telemark 1992–2022 versus a population index for Capercaillie/Black Grouse. The prey species indices are first-differences of log-transformed number harvested by hunters in autumn in Telemark and Vestfold Counties (Statistics Norway 2024). Horizontal dotted lines indicate the critical value for p = 0.05.

Table 3. Parameter estimates from multiple regression models with the relative change in recorded nesting attempts of Goshawks in central parts of Telemark 1993–2022 (n = 30) as response variable. The explanatory variables are standardized values of first-differences of log-transformed number of prey species killed by hunters in autumn in Telemark and Vestfold Counties (Statistics Norway 2024) in either the previous (t-1) or current year (t). Cumulative values are given for R^2.

Explanatory variable	Estimate	SE	df	R^2	F	p
All recorded nesting attempts						
Intercept	0.033	0.021	1			
Thrush spp., t	0.093	0.024	1	0.35	14.64	0.0008
Wood Pigeon/Hooded Crow, t	0.073	0.026	1	0.44	7.84	0.0097
Hazel Grouse, t	0.051	0.027	1	0.56	4.31	0.0483
Capercaillie/Black Grouse, t-1	0.055	0.026	1	0.62	4.24	0.0499
Only nesting attempts of adult Goshawk females (≥3 years old)						
Intercept	0.025	0.034	1			
Wood Pigeon/Hooded Crow, t	0.126	0.041	1	0.20	9.37	0.0051
Capercaillie/Black Grouse, t-1	0.116	0.040	1	0.31	8.33	0.0078
Thrush spp., t	0.101	0.035	1	0.47	7.96	0.0091

DISCUSSION

We found several significant or almost significant positive relationships between indices of reproductive effort for breeding Goshawk and indices of prey abundance. In the analyses, we distinguished between all nesting attempts and successful nesting attempts of Goshawks. It is, however, likely that also the former index was influenced by variation in nesting success, since unsuccessful nesting attempts were more difficult to register. Nevertheless, we assumed that food shortage was the major cause of nesting failure. Some incidents of illegal human persecution may have occurred, but we have no reasons to believe that anthropogenic losses were a common source of unsuccessful nesting attempts in the study area (Selås et al. 2017).

The nesting success was lower for young than for adult Goshawk females. Among adults, there was little difference between individuals that were newly established in a territory versus birds that nested there in the preceding year. Hence, the age of the Goshawk female seems to be an important factor for the nesting outcome, as also found by Nielsen and Drachmann (2003). When correcting for the proportion of replacements, the annual proportion of young Goshawk females appeared to be affected by weather conditions in April. The linkage could be due to the direct effects of unfavourable weather conditions, but also by effects of weather on population levels of important prey species (Huhtala & Sulkava 1981). However, Lehikoinen et al. (2013) concluded that early spring weather was more important for Goshawk breeding success than the density of grouse.

The annual proportion of Goshawk female replacements was positively related to the population indices of several prey species, without time-lag. The finding was contrary to the pattern that would be expected if high recruitment rates were due to high adult mortality. Large annual fluctuations in adult mortality were not expected anyways (Marcström et al. 1990). Our interpretation of the observed pattern is that a larger proportion of newly settled Goshawk females attempted to nest, or succeeded with their nesting attempt, in years with increasing prey numbers. In several stable Goshawk territories in our study area, replacements of the nesting Goshawk female often occurred after a year without nesting, or after a year with unsuccessful nesting attempt, when no moulted feathers were found. We suspect that many of these events of nesting failure reflected poor body condition of the new Goshawk female. In Finland, both clutch sizes and egg volume was smaller in nests that failed than in successful nesting attempts (Byholm & Nikula 2007).

The reason for a lack of a time-lag between prey indices and the proportion of Goshawk female replacements could be that the majority of newly settled females had not been present in the territory long enough to benefit from prey abundance in the preceding winter. Changes in prey number from one autumn to another are likely to depend mainly on summer reproduction, but it may also to some extent reflect the prey's winter survival, and thus availability to Goshawks in spring. The relative importance of winter survival for the annual change in autumn number of a prey species is probably negatively correlated with its reproductive capacity, and may thus be more important for Hooded Crow and Wood Pigeon than for grouse.

In the analyses of relative change in the number of recorded nesting attempts, the predicted one-year time-lag for relationships with important winter-resident prey species was most apparent when only successful nesting attempts were used. The abundance of the prey species in question varies much more than the number of nesting Goshawk pairs (Andrén 1990, Andrén & Lemnell 1992, Lindström 1994). When unsuccessful nesting attempts were excluded, the amplitude of the relative change in recorded Goshawk nesting attempts increased. This pattern is probably the main reason for improved correlation with prey indices of the previous year when only successful Goshawk nesting attempts were considered.

The expected one-year time-lag was most evident for grouse, somewhat less for the Red Squirrel, and least for the corvid species. The lack of a lag for corvids could be because particularly Hooded Crows, due to their behaviour, are less vulnerable to Goshawk predation outside the nesting season (Marcström et al. 1990), but also because many corvids leave the forest-dominated areas in winter. Goshawk females may commonly leave their territories in winter too (Widén 1985, Rolstad et al. 2017), but seasonal movements are likely to depend on food supply. We found no relationships with the Mountain Hare index, suggesting that this nocturnal species is less available for the diurnal Goshawk during winter in our study area. Sulkava et al. (1994) found that clutch and brood sizes of Goshawks in Finland were positively related to the previous autumn's population indices of forest grouse, but not to indices for Red Squirrel. However, we find it likely that there are temporal and regional variations in the relative importance of these prey groups.

In Fennoscandia, Goshawk populations resisted the heavy hunting pressure in the early 1900s (Dahl 1927, Sollien 1979, Marcström et al. 1990). Apparently, there have always been enough young Goshawks to fill up available nesting territories. In our study area, there may have been some minor changes in the total number of Goshawk nesting territories during the 32-year study period, but such changes were almost certainly related to changes in food supply, and not to variation in the total number of Goshawks present (Selås 1997). We conclude that the annual variations in recorded nesting attempts in Telemark to a large extent reflected the effect of prey density on the body condition of Goshawk females, but without the predicted one-year time-lag for young and newly settled individuals.

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Appendix 1. Annual number of recorded nesting attempts of Goshawks in central parts of Telemark County. Goshawk females were classified as young (1–2 years) or old birds (≥ 3 years) based on patterns in moulted feathers. The difference between total number and the sum of successful and unsuccessful numbers are nesting attempts with unknown result.

Year	Total number	Successful number	Unsuccessful number	Old female	Young female	Old successful
1991	20	17	2	14	1	14
1992	19	15	4	17	1	14
1993	15	5	2	12	0	5
1994	11	9	2	6	0	4
1995	8	6	1	6	0	5
1996	13	8	4	9	2	7
1997	15	10	3	12	1	10
1998	12	10	2	11	0	9
1999	16	14	2	12	3	10
2000	19	16	2	18	0	15
2001	22	19	1	17	1	16
2002	27	21	5	17	5	15
2003	29	27	1	24	1	23
2004	33	26	4	26	2	23
2005	36	30	3	28	5	27
2006	28	25	3	24	2	22
2007	34	29	4	21	8	18
2008	39	33	4	30	3	28
2009	40	32	8	31	5	27
2010	46	37	6	32	5	31
2011	46	40	6	34	4	33
2012	43	38	5	38	2	35
2013	37	21	16	28	1	19
2014	39	27	12	26	4	23
2015	42	32	10	28	3	24
2016	41	34	6	22	13	19
2017	44	33	10	31	5	26
2018	44	35	9	30	8	28
2019	46	31	14	33	3	27
2020	46	34	12	37	3	31
2021	45	36	9	37	1	35
2022	42	29	13	28	4	25
2023	42	33	9	32	4	30